Marine Life Protection Act Initiative

Science Advisory Team Analysis of Military Use Areas in the South Coast

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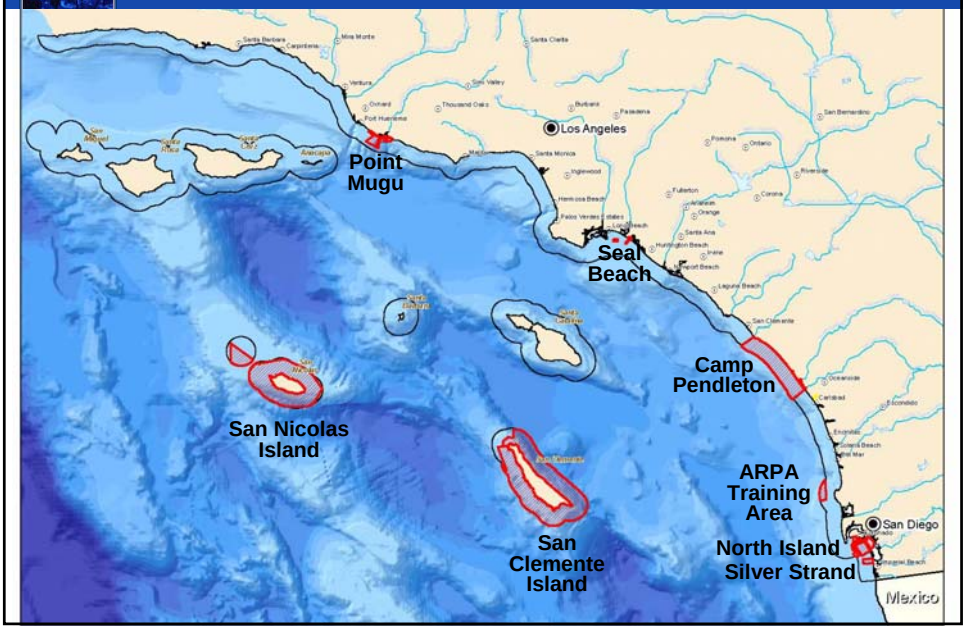
Presented to the MLPA Blue Ribbon Task Force
February 26, 2009 • Santa Barbara, CA

Request from Blue Ribbon Task Force

- The MLPA Blue Ribbon Task Force requested that the MLPA Master Plan Science Advisory Team (SAT) provide descriptions and analyses of:
  - the ecological characteristics of the islands and mainland areas used by the military,
  - the habitats represented in these areas,
  - the ecological linkages between these and other southern California sites, and particularly, between the islands and the mainland coast of southern California, and
  - any other important considerations for effective marine protected area (MPA) network design.

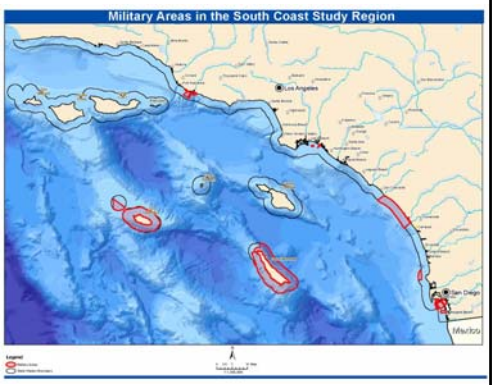
Military Use Areas in the South Coast Study Region



Military Use Areas in the South Coast Study Region

Habitat	South Coast Study Region Total	Percent (%) in Military Areas
Beaches (mi)	379.8	17%
Rocky Shores (mi)	280.5	19%
Kelp (mi)	198.2	28%
Avg Kelp Area (sq mi)	17.9	33%
Hard 0-30m proxy (mi)	199.4	26%
*Hard 0-30m (sq mi)	162.0	20%
Hard 30-100m (sq mi)	183.5	30%
Hard 100-200m (sq mi)	75.0	27%
Hard 200-3000m (sq mi)	96.6	31%
Soft 0-30m proxy (mi)	359.3	12%
*Soft 0-30m (sq mi)	499.3	16%
Soft 30-100m (sq mi)	816.6	10%
Soft 100-200m (sq mi)	147.0	12%
Soft 200-3000m (sq mi)	317.5	27%

*Accuracy of area estimates for shallow substrate is limited by barriers to mapping nearshore habitats



Sources of Habitat Data
Shore: National Oceanic and Atmospheric Administration and The Nature Conservancy
Kelp: California Department of Fish and Game
Bottom type: NOAA, Gary Greene, Guy Cochrane, Rikk Kvitek

Ecological Features of Navy Islands

- **San Clemente and San Nicolas islands are the most isolated and remote islands in the Southern California Bight**
- **Less accessible to various interest groups**
  - Larger kelp bass, sheephead and lobsters
  - Abundant giant seabass
- **Less likely to be affected by mainland pollution**
- **Least impacted by invasive species**
  - E.g., *Sargassum filicinum*
- **Unique larval source and sink processes**

Ecological Features of Navy Islands

- **Disproportionate amount of (more) quality rocky reef habitat and kelp beds**
  - Less pollution and sedimentation, and presence of large predators contribute to abundant kelp
- **Significantly deeper kelp habitat**
  - Due to water clarity
- **Unusually large stands of surfgrass**
- **Largest populations of purple hydrocoral**
  - Excluding Farnsworth Bank (Santa Catalina)
- **Critical and substantial marine mammal haulouts and bird roosting areas**

Marine Birds on Military Properties

- **7 marine bird species breed on military properties**
  - Brandt's Cormorant (*Phalacrocorax penicillatus*)
  - Western Gull (*Larus occidentalis*)
  - California Least Tern (*Sternula antillarum browni*)
  - Western Snowy Plover (*Charadrius alexandrinus nivosus*)
  - Black Oystercatcher (*Haematopus bachmani*)
  - Ashy Storm-petrel (*Oceanodroma homochroa*)
  - Xantus's Murrelet (*Synthliboramphus hypoleucus*)

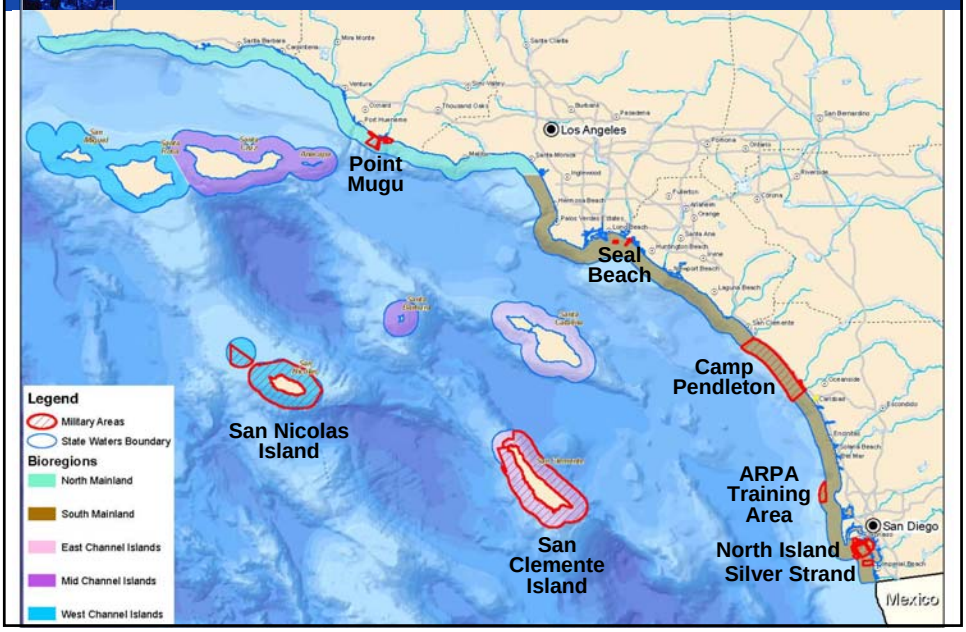
Status of Marine Birds on Military Properties

- **Brandt's Cormorant – Endemic to west coast, vulnerable to human-caused disturbance**
- **Western Gull – Endemic to California Current**
- **California Least Tern – Endangered (U.S. and CA) due to loss of breeding habitat**
- **Western Snowy Plover – Threatened (U.S.) due to loss of breeding habitat**
- **Black Oystercatcher – Species of conservation concern (U.S. Fish and Wildlife Service)**
- **Ashy Storm-petrel – Species of conservation concern (USFWS and CA Department of Fish and Game)**
- **Xantus's Murrelet – Threatened (CA), candidate (U.S.)**

Marine Mammals on Military Properties

- **4 marine mammal species rest and forage on military properties**
  - California sea lion (*Zalophus californianus*)
  - Pacific harbor seal (*Phoca vitulina richarii*)
  - Northern elephant seal (*Mirounga angustirostris*)
  - Southern sea otter (*Enhydra lutris nereis*)
- **All protected under the U.S. Marine Mammal Protection Act**
- **Southern sea otter listed as threatened under Endangered Species Act of 1973**

Bioregions of the South Coast Study Region

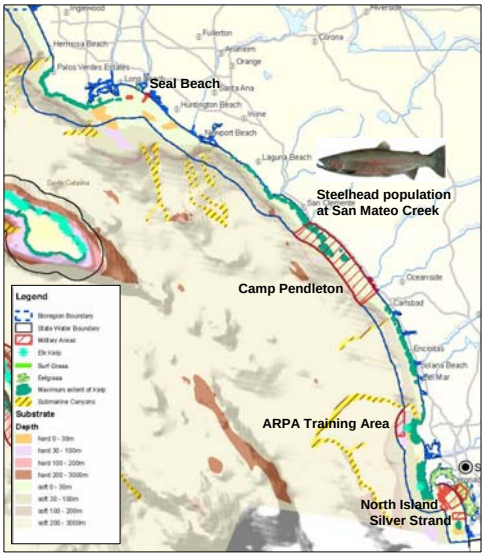


Marine Habitats: South Mainland

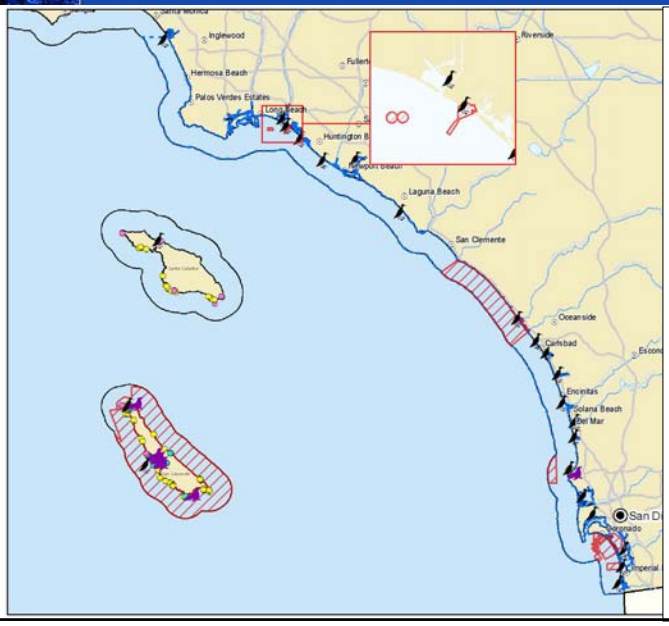
[1] Includes Seal Beach, Camp Pendleton, Advanced Research Projects Agency (ARPA) Training Area, Silver Strand and North Island

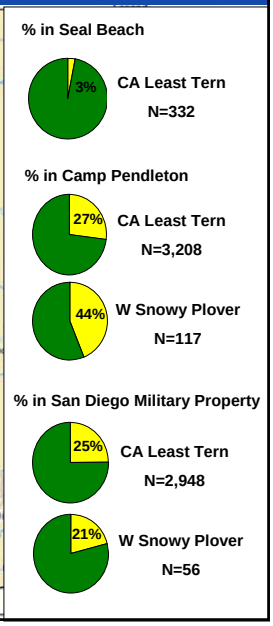
Habitat	South Mainland Bioregion	Percent (%) in Military Areas[1]
Beaches (mi)	147.7	16%
Rocky Shores (mi)	28.9	6%
Kelp (mi)	30.1	6%
Avg Kelp Area (sq mi)	2.9	8%
Hard 0-30m proxy (mi)	28.7	0%
*Hard 0-30m (sq mi)	46.7	3%
Hard 30-100m (sq mi)	13.6	21%
Hard 100-200m (sq mi)	0.8	2%
Hard 200-3000m (sq mi)	1.2	0%
Soft 0-30m proxy (mi)	128.6	15%
*Soft 0-30m (sq mi)	245.3	24%
Soft 30-100m (sq mi)	148.6	13%
Soft 100-200m (sq mi)	21.4	6%
Soft 200-3000m (sq mi)	68.6	0%

*Accuracy of area estimates for shallow substrate is limited by barriers to mapping nearshore habitats

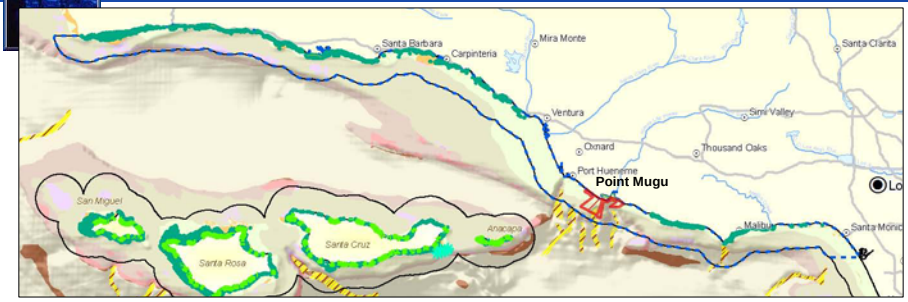


Birds and Mammals: South Mainland





Marine Habitats: North Mainland



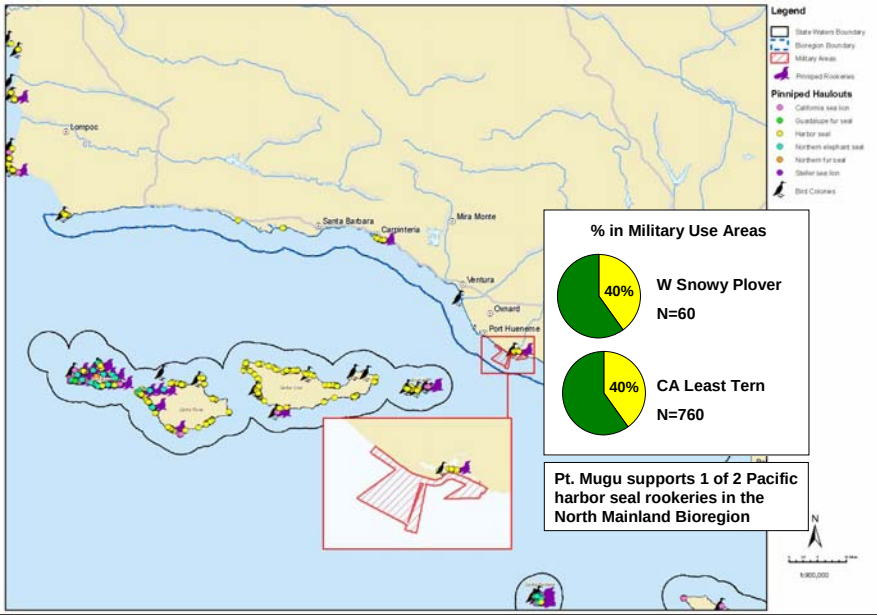
Habitat	North Mainland Bioregion	Percent (%) in Military Areas
Beaches (mi)	102.5	5%
Rocky Shores (mi)	30.4	0%
Kelp (mi)	24.2	0%
Avg Kelp Area (sq mi)	2.9	0%
Hard 0-30m proxy (mi)	13.2	0%
*Hard 0-30m (sq mi)	31.4	0%
Hard 30-100m (sq mi)	22.6	0%
Hard 100-200m (sq mi)	2.4	0%

Habitat	North Mainland Bioregion	Percent (%) in Military Areas
Hard 200-3000m (sq mi)	1.0	0%
Soft 0-30m prox (mi)	117.9	4%
*Soft 0-30m (sq mi)	155.1	2%
Soft 30-100m (sq mi)	215.8	2%
Soft 100-200m (sq mi)	21.2	1%
Soft 200-3000m (sq mi)	22.0	0%

*Accuracy of area estimates for shallow substrate is limited by barriers to mapping nearshore habitats

Point Mugu is an area of special biological significance (ASBS)

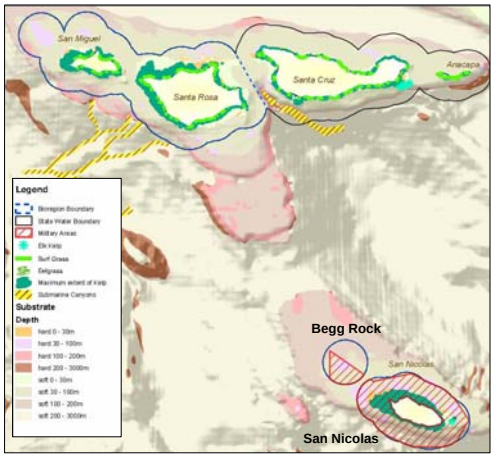
Birds and Mammals: North Mainland



Marine Habitats: West Channel Islands

Habitat	West Channel Islands Bioregion	Percent (%) in Military Areas[1]
Beaches (mi)	40.7	26%
Rocky Shores (mi)	75.0	21%
Kelp (mi)	70.4	30%
Avg Kelp Area (sq mi)	8.1	35%
Hard 0-30m proxy (mi)	42.9	40%
*Hard 0-30m (sq mi)	46.1	35%
Hard 30-100m (sq mi)	41.2	46%
Hard 100-200m (sq mi)	6.9	5%
Hard 200-3000m (sq mi)	0.1	6%
Soft 0-30m proxy (mi)	72.4	25%
*Soft 0-30m (sq mi)	70.1	18%
Soft 30-100m (sq mi)	250.0	18%
Soft 100-200m (sq mi)	54.3	10%
Soft 200-3000m (sq mi)	29.1	68%

*Accuracy of area estimates for shallow substrate is limited by barriers to mapping nearshore habitats



[1] Includes San Nicolas Island and Begg Rock

Marine Habitats: West Channel Islands

Habitat	West Channel Islands Bioregion	Percent (%) in Existing MPAs
Beaches (mi)	40.7	10%
Rocky Shores (mi)	75.0	19%
Kelp (mi)	70.4	13%
Hard 0-30m proxy (mi)	42.9	24%
*Hard 0-30m (sq mi)	46.1	11%
Hard 30-100m (sq mi)	41.2	25%
Hard 100-200m (sq mi)	6.9	36%
Hard 200-3000m (sq mi)	0.1	0%
Soft 0-30m proxy (mi)	72.4	12%
*Soft 0-30m (sq mi)	70.1	14%
Soft 30-100m (sq mi)	250.0	20%
Soft 100-200m (sq mi)	54.3	32%
Soft 200-3000m (sq mi)	29.1	7%

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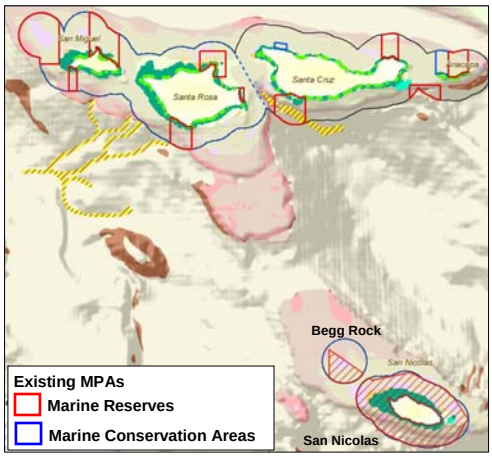


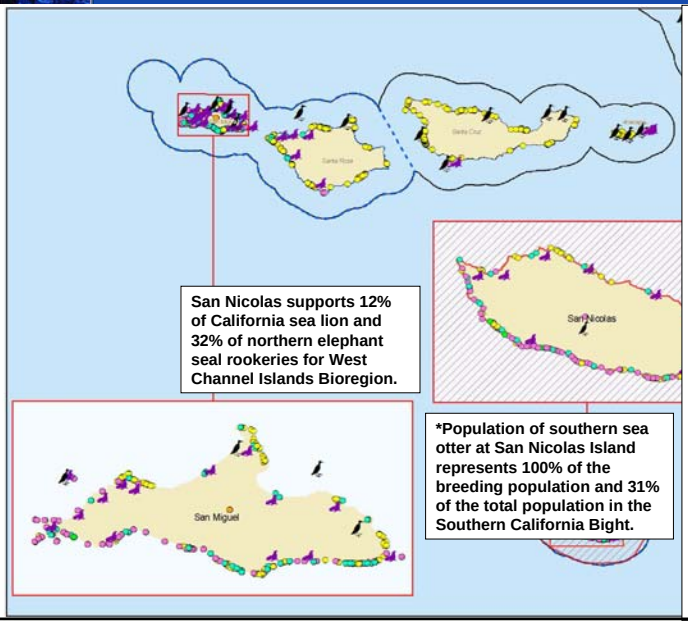
Ecological Features of San Nicolas

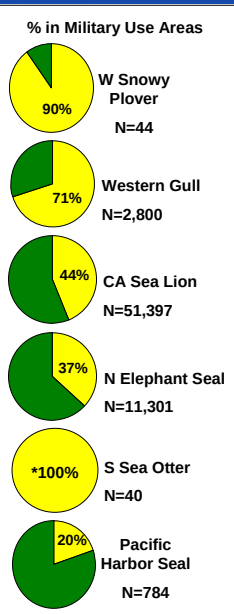
- **Significantly deeper eelgrass habitat**
  - Due to water clarity
- **Largest remaining remnant populations of endangered black abalone**
- **Presence of large predators enhances ecosystem function**
  - Larger predatory fish (e.g. kelp bass, sheephead, giant seabass) and invertebrates (e.g., lobster)
  - Resident southern sea otter population

Ecological Features of Begg Rock

- **Emergent sheer pinnacle reef 10 miles west of San Nicolas**
- **Unique invertebrate assemblage, including:**
  - Purple hydrocoral
  - Shallow aggregations of *Metridium* and other anemones

Birds and Mammals: West Channel Islands





Marine Habitats: East Channel Islands

[1] San Clemente area is based on military operation areas around San Clemente Island and is a slightly smaller area than all the state waters around San Clemente Island

Habitat	East Channel Islands Bioregion	Percent (%) in Military Areas[1]
Beaches (mi)	61.39	40%
Rocky Shores (mi)	62.31	56%
Kelp (mi)	49.40	67%
Avg Kelp Area (sq mi)	3.1	89%
Hard 0-30m proxy (mi)	71.65	50%
*Hard 0-30m (sq mi)	25.27	56%
Hard 30-100m (sq mi)	89.28	38%
Hard 100-200m (sq mi)	55.22	35%
Hard 200-3000m (sq mi)	84.41	35%
Soft 0-30m proxy (mi)	4.31	86%
*Soft 0-30m (sq mi)	3.69	88%
Soft 30-100m (sq mi)	15.26	80%
Soft 100-200m (sq mi)	15.58	71%
Soft 200-3000m (sq mi)	129.89	50%

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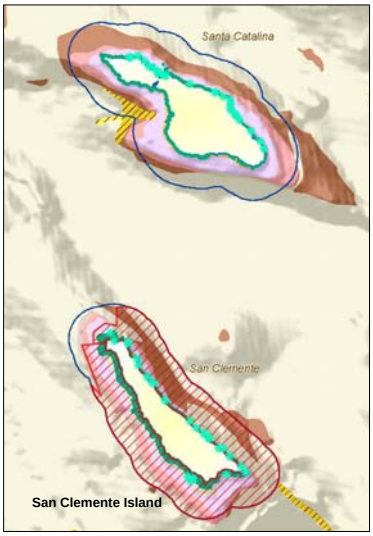
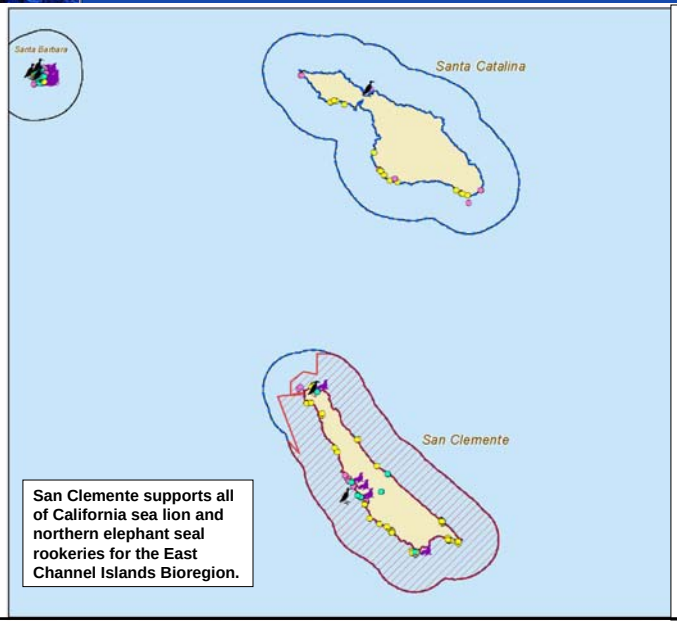


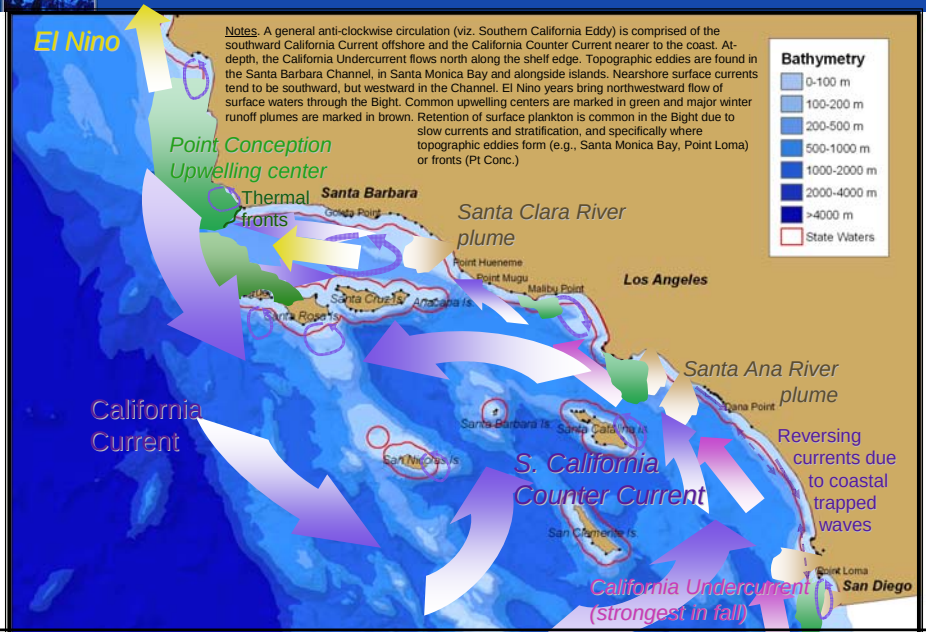
Unique Features of San Clemente

- **Northern range extensions of Panamic species**
  - Panamic arrow crab (*Stenorhynchus debilis*)
  - Warty sea slug (*Pleurobranchus areolatus*)
  - Arbacia sea urchin (*Arbacia incisa*)
  - Guadalupe cardinalfish (*Apogon guadalupensis*)
  - Pink cardinalfish (*A. pacificus*)
  - Swallow damselfish (*Azurina hirundo*)
  - Purple brotula (*Oligopus diagrammus*)
- **Only rock-based morph of elk kelp (*Pelagophycus porra*) at the islands**
- **Remnant population of endangered white abalone (*Haliotis sorenseni*)**

Birds and Mammals: East Channel Islands



South Coast Circulation Patterns



Modeling Connectivity

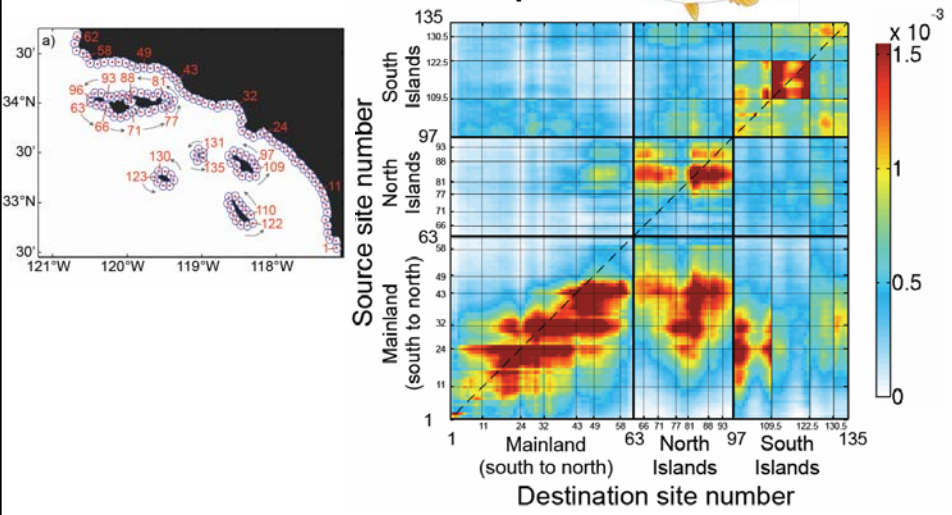
- **Model of larval dispersal using Regional Ocean Modeling System (ROMS)**
  - Modeling by S. Mitarai, D. Siegel, J. Watson, J. McWilliams, and C. Dong
  - Based on ocean circulation data from 1996-2003
  - Underestimates local retention
- **Model Inputs**
  - Accounts for adult spawning period and number of days in the larval stage for approx. 10 representative species
  - Larvae modeled as passive particles
- **Model is limited by data and assumptions but provides the best estimate of potential connectivity between different places**

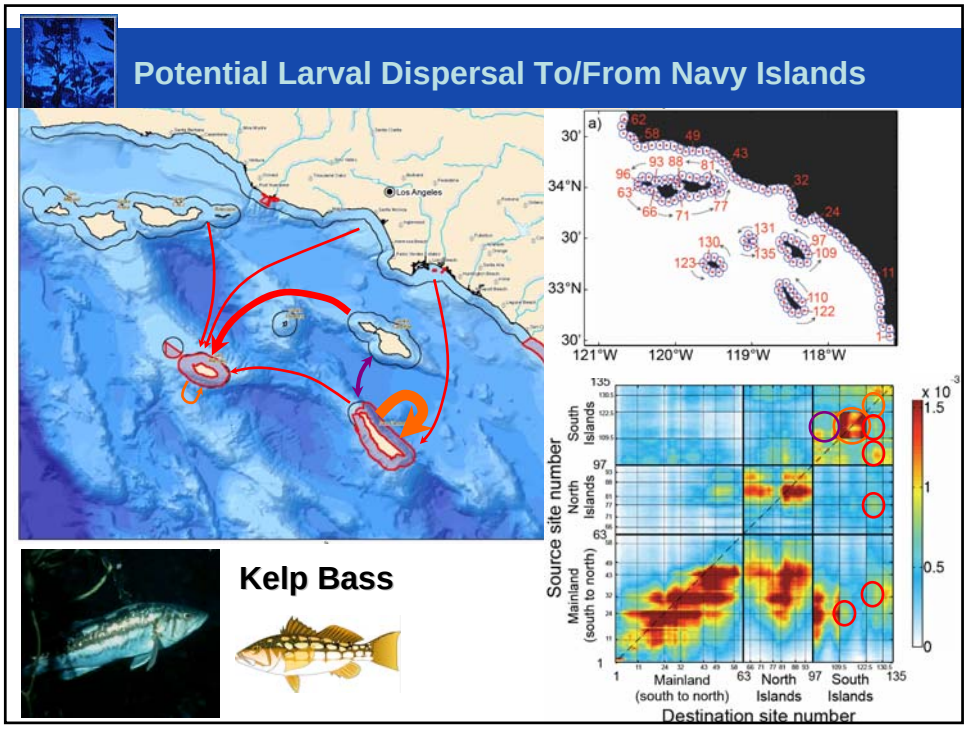
Characteristics of Model Species

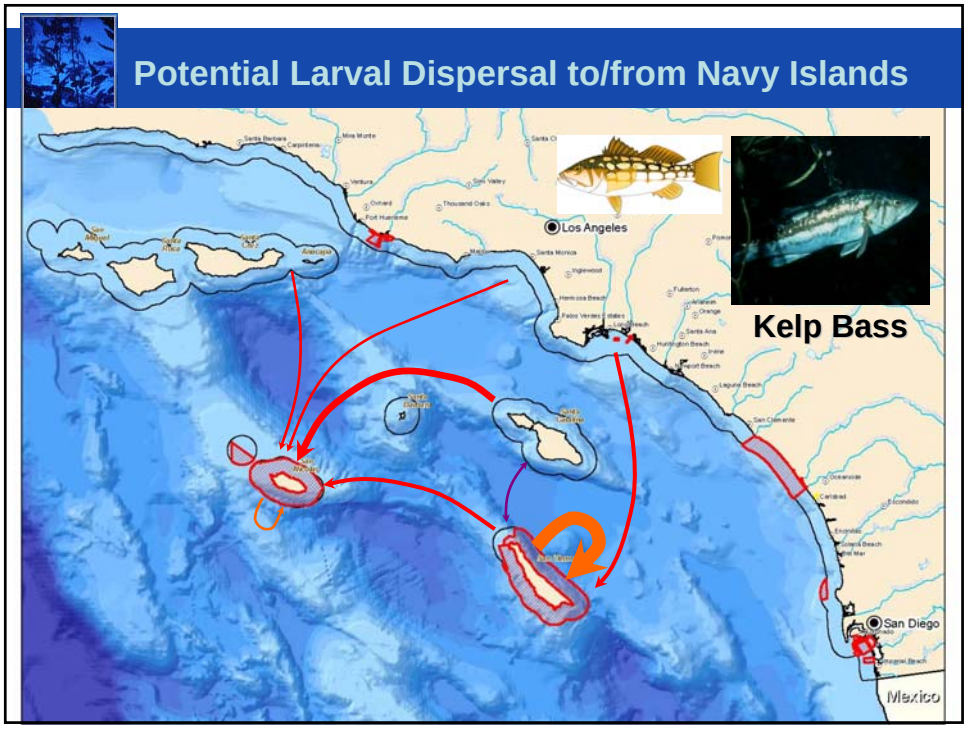
Common Name	Spawning Season	Larval Duration
Kelp bass	Apr-Nov (peak is May-Sep)	25-33 days
Lingcod	Nov -Apr	30-120 days
Red sea urchin	Dec-Feb	40-60 days
Cabezon	Oct-Mar	90-120 days
Blue rockfish	Jan-May	90-180 days

Model Results: Connectivity Matrix

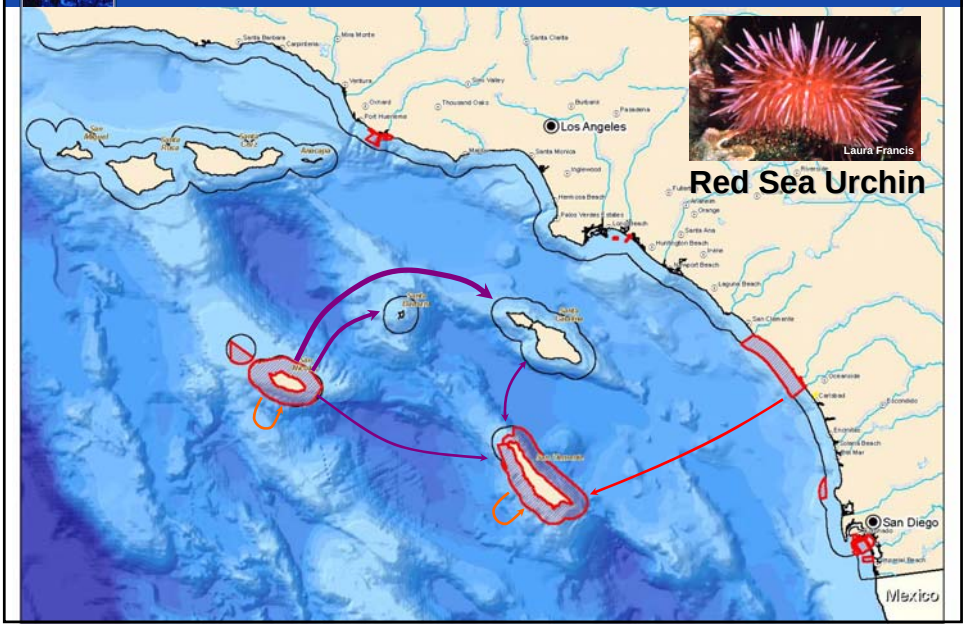
Kelp Bass



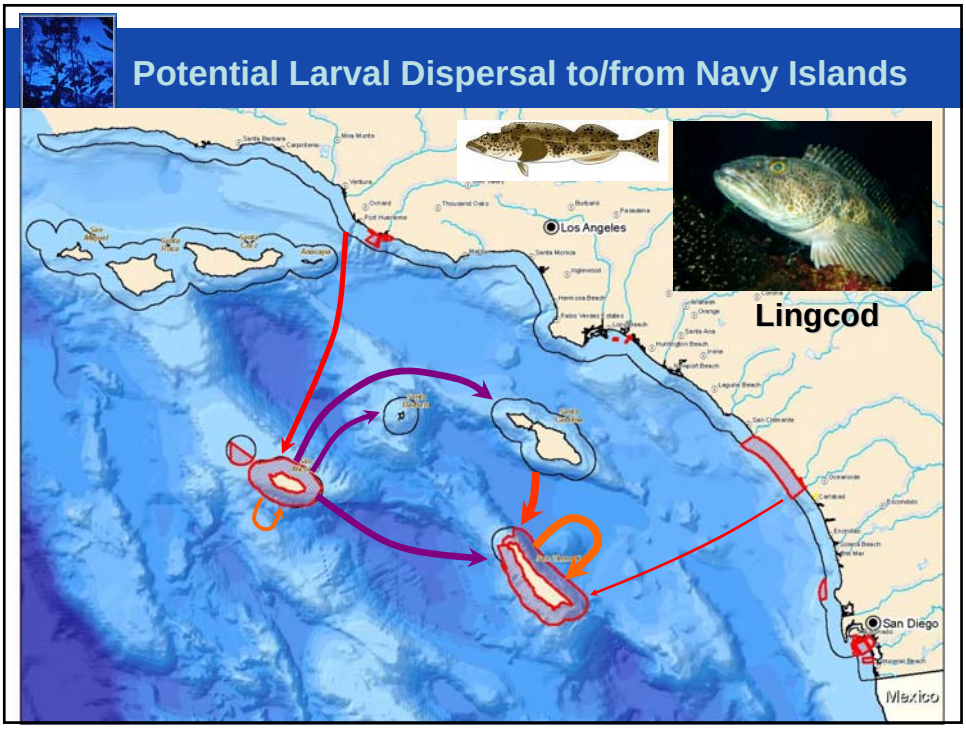

Potential Larval Dispersal To/From Navy Islands
Los Angeles
a)
30°
34°N
30'
33°N
30'
121°W
120°W
119°W
118°W
Source site number
South Islands
North Islands
Mainland (south to north)
Mainland (south to north)
North Islands
South Islands
Destination site number
x 10
1.5
1
0.5
0
Kelp Bass

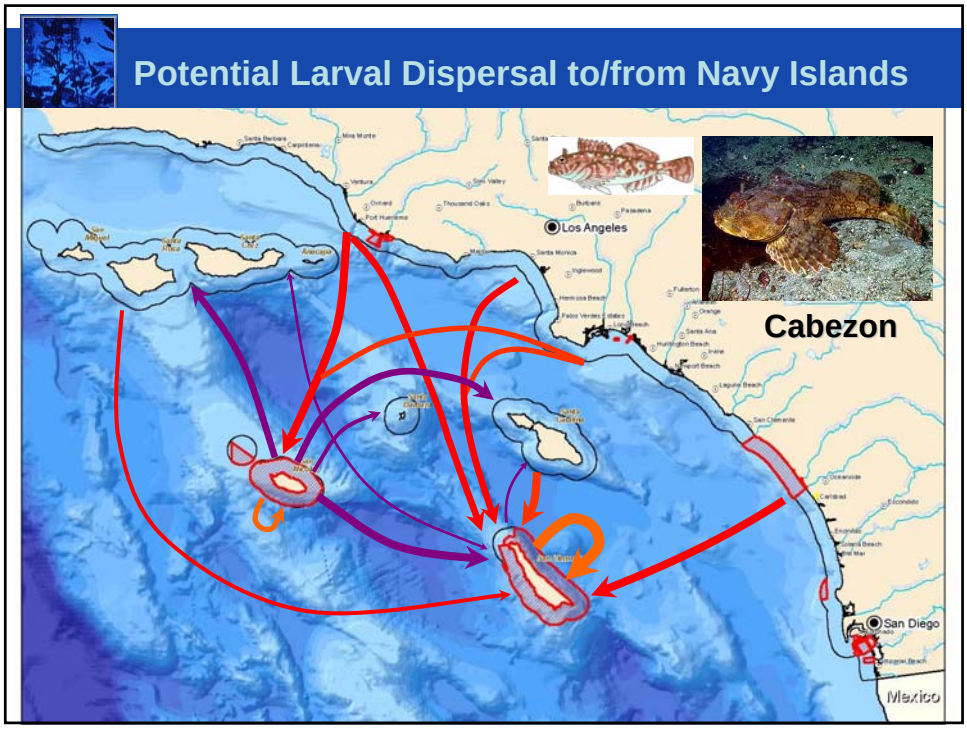

Potential Larval Dispersal to/from Navy Islands
Los Angeles
Kelp Bass
San Diego
Mexico

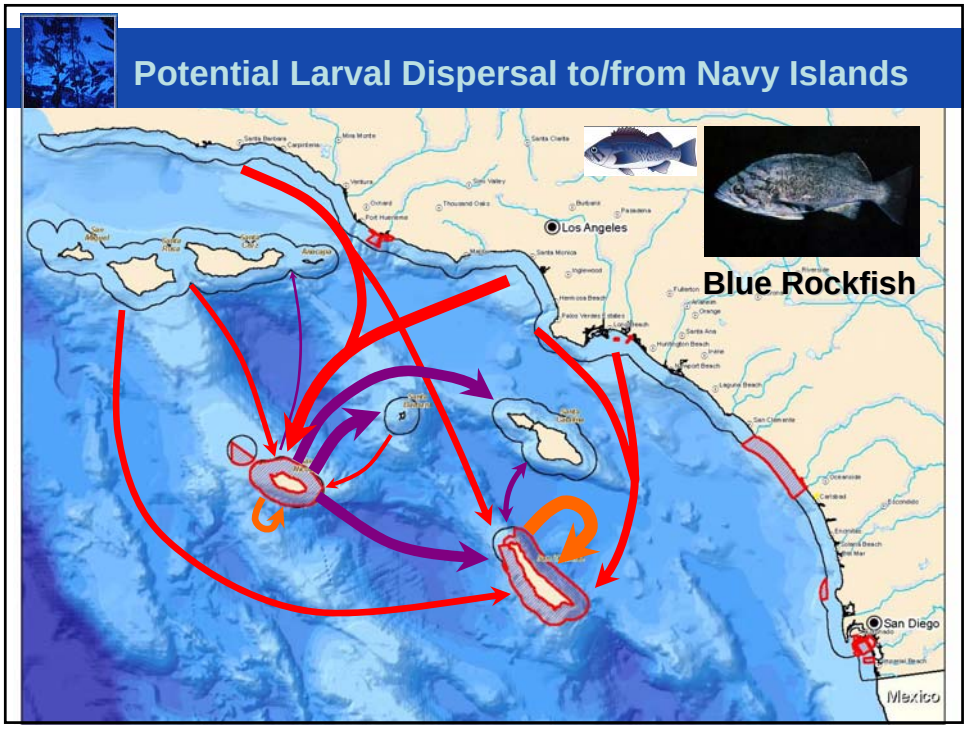
Potential Larval Dispersal to/from Navy Islands



Potential Larval Dispersal to/from Navy Islands




Potential Larval Dispersal to/from Navy Islands
Los Angeles
San Diego
Mexico
Cabezon


Potential Larval Dispersal to/from Navy Islands
Los Angeles
San Diego
Mexico
Blue Rockfish

Summary: Connectivity

Modeling results suggest:

- San Clemente Island has high local recruitment and tends to receive larvae from other places in the study region, but has a limited role as a source of larvae, with the strongest connections to Santa Catalina Island.
- San Nicolas Island is connected somewhat to Santa Barbara, San Clemente, Santa Catalina and, in some cases, the northern Channel Islands though exchange of larvae. San Nicolas also receives larvae that originate along the mainland coast.
- Ecological roles of San Clemente and San Nicolas islands are unique and not redundant with other islands or mainland coast.

Summary: Habitats

- Military areas represent 18% of the mapped habitats in the MLPA South Coast Study Region
- Military areas account for greatest percentage of habitats in East Channel Islands Bioregion (45%) and West Channel Islands Bioregion (27%)
- Because of their geology and geography, San Clemente and San Nicolas contain important and sometimes large amounts of habitat that are not replicated or are poorly replicated in the study region
- Due to their location at long distances from the mainland, San Nicolas and San Clemente are exposed to reduced anthropogenic stressors common in other locations of the study region

Summary: Biotic Features

- Waters of San Clemente, San Nicolas, Begg Rock and Point Mugu are *areas of special biological significance* in recognition of their biologically unique and sensitive marine ecosystems
- San Nicolas Island supports threatened southern sea otter, endangered black abalone, and deep eelgrass
- San Clemente supports rare purple hydrocoral, endangered white abalone, only rock-based morph and one of two locations for sand-based morph of elk kelp
- Kelp beds at San Clemente and San Nicolas account for 89% and 35% of this habitat in East and West Channel Island bioregions, respectively

Summary: Birds and Mammals

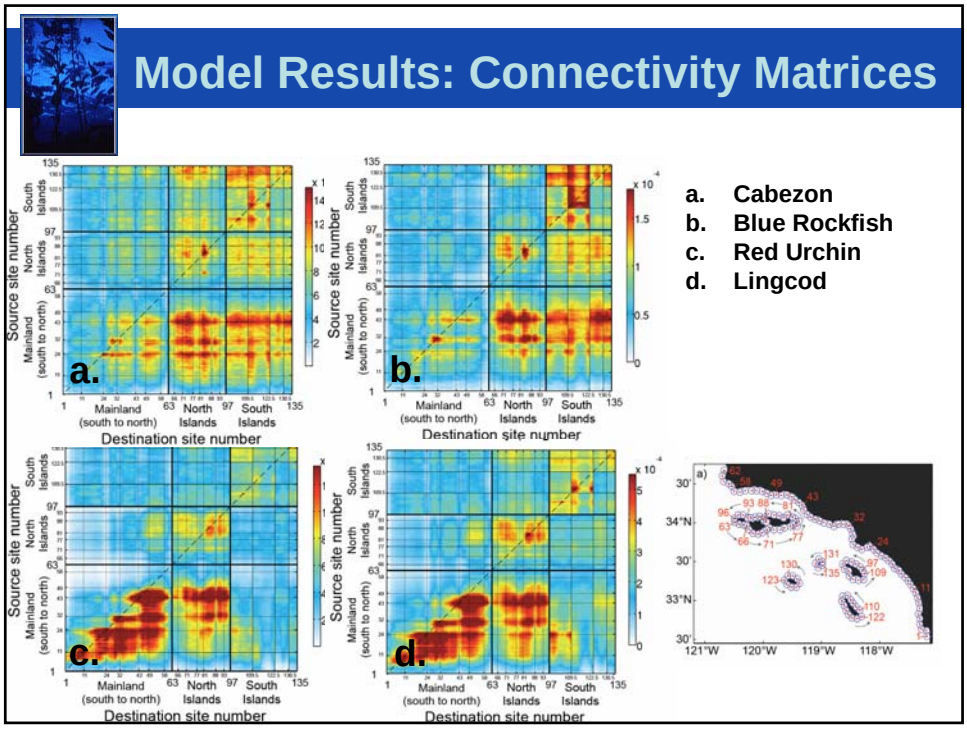
- Military properties support the majority of the endangered least tern (53%) and threatened western snowy plover (60%) breeding populations within the Southern California Bight
- San Clemente supports majority of breeding colonies and haul-outs for the East Channel Islands bioregion due to the high human presence at Santa Catalina
- San Nicolas is a significant island for California sea lions, northern elephant seals and southern sea otter within the Southern California Bight
- Reducing the number of boats approaching these areas and protecting the prey base close to colonies and haul-outs will help sustain the longevity of these populations

Conclusions

- Because the military use areas include large amounts of key habitat and contain unique biological communities within the MLPA South Coast Study Region, these areas will play significant roles in meeting the science objectives of the Marine Life Protection Act (MLPA)
- The military use areas on San Nicolas Island (including Begg Rock) and San Clemente Island are particularly important to meeting MLPA objectives within the West Channel Islands and East Channel Islands Bioregions

Conclusions

- Contributions to the MLPA made by any proposed closures in military use areas can best be determined in the context of alternative MPA proposals for the entire study region
- Consequently, the SAT recommends that any proposed closures in military use areas be considered as part of the full SAT evaluation of these alternative MPA proposals
  - To assess the contribution of proposed closures to ecosystem protection within each bioregion and the entire study region
  - To determine the role of proposed closures as part of an integrated regional network of MPAs


Model Results: Connectivity Matrices
a.
b.
c.
d.
Source site number
Destination site number
Mainland (south to north)
North Islands
South Islands
a. Cabezon
b. Blue Rockfish
c. Red Urchin
d. Lingcod